GEOPHYSICAL SURVEYS

BAY DIVISION PIPELINE MARINE MAMMAL MONITORING PLAN

Prepared for
NOAA Fisheries
Office of Protected Resources Permits
Conservation and Education Division

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Introduction

The SFPUC is proposing to construct an underground trans-bay water pipeline (Bay Tunnel) south of the Dumbarton Bridge in South San Francisco Bay (Figure 1). Geotechnical data are needed to develop criteria for tunnel design and to assist the design team with key decisions on tunnel alignment, tunnel and shaft construction methods, and tunnel and shaft lining design. To collect the necessary data, field investigations consisting of core samples and geophysical surveys along the proposed alignment alternatives will be conducted. The proposed project is authorized under the General Conditions for Nationwide Permit (NWP) No. 6 for Survey Activities. This includes core sampling, seismic exploratory operations and plugging of bore holes.

This marine mammal monitoring plan only involves the geophysical (seismic) aspect of the proposed geotechnical studies and includes 21 seismic sample transects. A total of 25 to 35 linear miles (40 to 56 km) of marine-based geophysical sampling will be conducted. The marine seismic reflection data will be collected along a series of lines that cross the Bay centered over the projected alignment (Figure 2). A centerline and four wing lines are planned. Cross lines, or tie lines, will be run perpendicular to the centerline and extend 200 to 500 meters beyond the alignment parallel lines unless restricted by water depth or man-made obstructions. Water depths in the survey area range from roughly 45 feet (14 meters) in the deeper mid-Bay channel to about 6 to 8 feet (1.8 – 2.4 m) (at high tide) along the shore and in Newark Slough. Work will be conducted at high tide in the shallow nearshore areas.

The proposed seismic study spans from Newark Slough and Plummer Creek adjacent to the Cargill Salt property in the east (Newark 7.5-minute USGS quad in the City of Newark), to the Ravenswood Baylands open space on the western shore of San Francisco Bay (Palo Alto 7.5-minute USGS quad in the City of East Palo Alto). The study will roughly parallel existing SFPUC trans-bay pipelines, approximately 1-mile south of the Dumbarton Bridge in South San Francisco Bay (Figure 2). Figure 2 shows the survey transect lines and coverage area.

Geophysical surveys will only be conducted during daylight hours from 7 am to 7 pm, when marine mammal monitoring prior to and during the surveys will be most effective. The surveys will take approximately 8 to 10 days to perform. Because much of the survey area is in shallow water, the optimum time for operations will be in daylight during high tide periods. Low tide periods will restrict operations to the deeper water areas. The survey will be scheduled between July 1 and November 30. This would be outside of the harbor seal pupping season. This window also avoids the time when grey whales might be encountered in the Bay and will avoid the time when listed fish species, including Steelhead and Chinook salmon, would be present.

The marine seismic surveys are scheduled to begin in mid-August, 2006 and continue 8 – 10 days as described above.

Potential Marine Mammal Species in Area

The species of marine mammals that have been observed within the San Francisco Bay consist primarily of the Pacific harbor seal (*Phoca vitulina richardsi*), California sea lion (*Zalophus californicus*), and gray whale (*Eschrichtius robustus*). Other species that have been sighted infrequently and usually near the Golden Gate include the harbor porpoise (*Phocoena phocoena*), the southern sea otter *Enhydra lutris*), humpback whale (*Megaptera noveangliae*), northern elephant seal (*Mirounga angustirostris*), Steller sea lion (*Eumetopius jubatus*) and northern fur seal (*Callorhinus ursinus*). Because several of the above-listed species are infrequent, rare or seldom observed visitors to the southern portion of the San Francisco Bay, the following list below includes the most likely marine mammal species affected by the proposed seismic study:

a. Pacific harbor seal
b. California sea lion
c. Gray whale

Any marine mammals present however will be monitored.

Methods

A safe zone will be strictly enforced.

Monitoring. Two monitors will be present during the surveys. Both monitors will be together on a single observation boat, separate from the survey boat, but will scan different sections of the overall survey area. The monitors will be equipped with a pair of high-quality binoculars, a digital laser range finder that will be accurate to +/- 3 feet, and a two-way radio for communication with the survey vessel.

The monitors will survey the area prior to the startup of equipment. Seismic surveys will begin only after no marine mammals (pinnipeds or cetaceans) are sighted within the "buffer zone" (zone of high sound pressure levels nearest the sound source) for at least 15 minutes prior to the initiation of the energy source (the buffer zone areas are defined below). If a marine mammal is sighted within the buffer zone during the 15 minute pre-startup monitoring period, the monitors will observe for another 15 minute period. After a 15 minute period with no sightings, the go-ahead for startup (soft start) will be relayed to the survey boat.

Monitors will continue to make observations during the survey transect runs. If a marine mammal is sighted in the buffer zone radius during seismic survey data collecting, the survey vessel will be instructed to cease operations and not resume surveys until the zone is clear from marine mammals for at least 15 minutes.

The buffer zone, where levels may exceed 180 dB, varies depending on the equipment that will be used. The buffer zone will be 45-meter radius for the Geopulse "boomer"

system, and a 100-meter radius for the Squid "mini-sparker" system. These distances are based upon empirical measurements of underwater sound attenuation for this equipment (Barnhardt et al 2001, Appendix A) and technical assistance provided by NOAA Fisheries.

Marine mammal observations made during the surveying will be recorded on daily observation data sheets.

Survey Transects. The survey ship will travel at approximately 3-4 knots (~3.5 – 4.6 miles/hour) along each transect line. The length of time for each survey transect will vary depending on the total distance of the transect. The longest transects spanning from east to west (Figure 2) will take approximately 1 hour to complete. This will include the time that the seismic equipment would be generating underwater sounds but would not include time to turn the boat and hydrophone array around and set up for the next transect. The equipment will be turned down to low power during the setup for the next transect. The shorter north-south transects will generally require less than 1 hour to complete.

Pre- and Post-Survey Monitoring. Marine mammal monitoring will be initiated prior to the first day of the seismic survey to establish baseline data for the project area. Monitors will make observations of the survey area for 1 day (daylight hours; 8 hours of observation) prior to the startup of the survey. Post-survey monitoring will occur for a similar one day period upon completion of the seismic survey.

Observations to be recorded during the pre- and post-survey monitoring include those items listed in "Reporting" below.

Reporting

URS will collect data for each distinct marine mammal species observed in the south Bay proposed project area during the period of the seismic surveys. The final report will be submitted to NOAA Fisheries (NMFS) within 90 days after completion of the proposed project. Time of individual observations, behavior exhibited, overall numbers of individuals observed, frequency of observation, the time corresponding to the daily tidal cycle and any marine mammal behavioral changes due to the geophysical surveys will be included in the report and recorded on daily observation data sheets.

References

Barnhardt, Walter. 2001. Geophysical surveys of Hawaiian coral reefs. Sound Waves (monthly newsletter) published by US Geological Survey. November.

FIGURES

URS Corporation L:\Projects\Bay_Division_Pipeline\MXD\Current Working Documents\Location_Map.mxd Date: 3/27/2006 3:46:06 PM Name: kvhoppe0

URS	Bay Division Pipeline 26815218	Map of San Francisco Bay California	Figure 1

N

NEWARK
VALVE HOUSE

FMC Corp

SAMTRANS
ROW

NEWARK SLOUGH

DUMBARTON
BRIDGE

DON EDWARDS
WILDLIFE
REFUGE

CARGILL BITTERN
PONDS

PLUMMER CREEK

EXISTING
BDPL 1 & 2

RAVENSWOOD
VALVE HOUSE

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LEGEND:

- SOUTH ALIGNMENT (5.08 MILES)
- SOUTH ALIGNMENT ALTERNATE (5.09 MILES)
- 19 — SURFACE GEOPHYSICAL TRAVERSE (SEISMIC REFLECTION)

APPROXIMATE SCALE

0 — 1/2 — 1 mile

URS

Project No. 26815218

SAN FRANCISCO PUBLIC UTILITIES COMMISSION BAY DIVISION PIPELINE RELIABILITY UPGRADE, BAY TUNNEL

LOCATION PLAN FOR SEISMIC SURVEY

FIGURE 2

Feb 28, 2006 – 8:22am
J:\CADSHARED\Bay Tunnel\Figures\Figure2-IHA.dwg

APPENDIX A

USGS science for a changing world

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Sound Waves Monthly Newsletter
Coastal Science & Research News from Across the USGS

Fieldwork

Geophysical Survey of Hawaiian Coral Reefs

By Walter Barnhardt
November 2001

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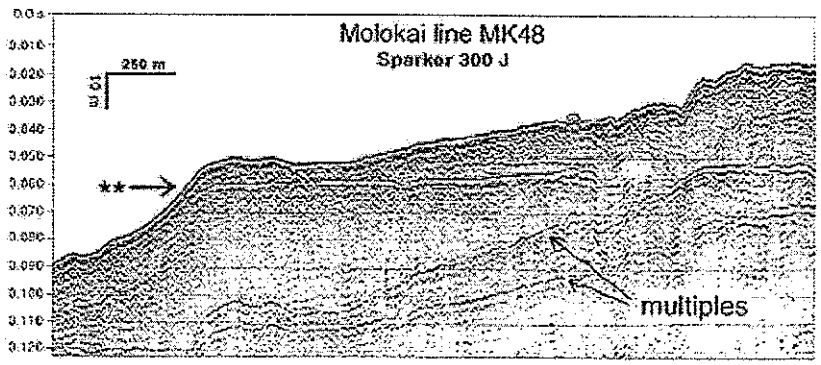
In early October, CMGP researchers from Menlo Park completed a two-week geophysical survey offshore from the Hawaiian Islands, where coral reefs are in decline. **Walter Barnhardt, Bruce Richmond, Pat Hart, Larry Kooker,** and **Mike Boyle** sailed on the R/V *Wailoa* with nearly every piece of high-resolution sub-bottom gear in the USGS arsenal (plus several systems that the USGS doesn't own).

Prior to the survey, and for the first time in the field, CMGP tested acoustic systems using a calibrated hydrophone as required under a permit from the National Marine Fisheries Service. The terms of the permit are meant to ensure that marine mammals are not harmed by research sound sources. Two days of testing determined the 160-dB safety zone for marine mammals, that is, the distance from the sound source at which the sound-pressure level had decreased to 160 decibels. The safe distances were 4 m for a Chirp system, 30 m for a boomer, and 100 m for a mini-sparker. If marine mammals were observed closer to the sound source than these distances, the system would have to be shut down and data collection temporarily halted. A team of three independent observers was on board to watch and warn of the approach of marine mammals. No whales were sighted and no shutdowns occurred.



Seismic-reflection profile across coral reef south of Molokai, Hawaii. The

Sound Waves
November 2001

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strong, flat-lying reflection (indicated by arrow at approximately 0.060 s) is continuous beneath large areas of the reef in this region.

The investigations focused on three study areas along the leeward coast of Molokai, and the windward and leeward coasts of Oahu (Mamala and Kailua Bays). The main objective was a better understanding of the geologic evolution of fringing reefs that have formed since the end of the last Ice Age. During that period, sea-level rise has flooded formerly exposed parts of older pre-Holocene reefs and generated a complex, three-dimensional structure of biogenic materials.

Coral reefs present special challenges for geologic studies. Reef growth is highly variable over small spatial scales, and widely spaced cores may not accurately resolve patterns of coral accumulation. With assistance from University of Hawaii researchers **Eric Grossman** (now with CMGP in Santa Cruz) and **Chip Fletcher**, we used seismic-reflection techniques to target and successfully image sections of a Holocene(?) reef up to 30 m thick. The most notable finding was the presence of a continuous, low-relief reflection that underlies extensive areas of reef off Molokai. Seismic profiles traced the buried surface parallel to shore for nearly the entire length of the island (approximately 40 km) and seaward to a depth of more than 130 m. As with any good science project, we returned home with as many new questions as answers. What is the nature of this marker horizon? Is it a wave-cut platform etched into older limestone? Are we imaging the upper surface of volcanic rocks? Planning is already underway on how to determine the acoustic velocities, compositions, and ages of the units that comprise Hawaiian reefs.

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